

LISTING OF THE CLAIMS

Following is a listing of claims in the application:

What is claimed is:

1 1. (Original) A monitor that can detect a plurality of trace molecules, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a photoionizer that is coupled to said ionizing chamber;
4 an electrospray ionizer coupled to said ionizing chamber;
5 a switch that controls the operation of said photoionizer and said electrospray ionizer to
6 control different modes of operation; and,
7 a detector that is coupled to said ionizing chamber.

1 2. (Original) The monitor of claim 1, wherein said electrospray ionizer includes a
2 vaporizer.

1 3. (Original) The monitor of claim 1, further comprising a chemical ionizer coupled
2 to said ionizing chamber and said switch.

1 4. (Original) The monitor of claim 3, wherein said chemical ionizer includes a
2 vaporizer.

1 5. (Original) The monitor of claim 2, further comprising a vacuum interface
2 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
3 that is orthogonal to said electrospray ionizer vaporizer.

1 6. (Original) The monitor of claim 4, further comprising a vacuum interface
2 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
3 that is orthogonal to said electrospray ionizer vaporizer.

1 7. (Original) The monitor of claim 1, further comprising a processor that controls
2 said switch.

3 8. (Original) The monitor of claim 1, wherein said switch operates in a mode where
4 said electrospray ionizer and said photoionizer are sequentially activated.

1 9. (Original) The monitor of claim 1, wherein said switch operates in a mode
2 where said electrospray ionizer and said photoionizer are simultaneously activated.

1 10. (Original) The monitor of claim 8, wherein said switch operates in a mode
2 wherein said electrospray ionizer and said photoionizer each generates a positive ion, then each
3 generates a negative ion.

1 11. (Original) The monitor of claim 8, wherein said switch operates in a mode
2 wherein said electrospray ionizer and said photoionizer each generates pairs of positive and
3 negative ions sequentially in time.

1 12. (Original) The monitor of claim 1, wherein said switch operates in a mode where
2 said photoionizer is on and said electrospray ionizer is switched between on and off states.

1 13. (Original) The monitor of claim 1, wherein said switch operates in a mode
2 wherein said electrospray ionizer is on and said photoionizer is switched between on and off
3 states.

1 14. (Original) The monitor of claim 1, wherein said electrospray ionizer and said
2 photoionizer each have an electrode that is supplied a voltage from a same voltage source.

1 15. (Original) The monitor of claim 9, further comprising a chemical ionizer that is
2 coupled to said switch and generates a positive ion sequentially with said electrospray ionizer
3 and said photoionizer, and then generates a negative ion sequentially with said electrospray
4 ionizer and said photoionizer.

1 16. (Original) The monitor of claim 10, further comprising a chemical ionizer that is
2 coupled to said switch and generates a positive and negative ion pair sequentially with said
3 electrospray ionizer and said photoionizer.

1 17. (Original) The monitor of claim 1, further comprising a valve that controls a
2 flow of a sample through an inlet of said electrospray ionizer and an inlet of said photoionizer.

1 18. (Original) The monitor of claim 17, wherein said valve sequentially allows the
2 sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 19. (Original) The monitor of claim 17, wherein said valve simultaneously allows
2 the sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 20. (Original) The monitor of claim 17, wherein said valve creates different flow
2 rates through said electrospray ionizer inlet and said photoionizer inlet.

1 21. (Original) A monitor that can detect a plurality of trace molecules, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a photoionizer that is coupled to said ionizing chamber;
4 an electrospray ionizer coupled to said ionizing chamber;
5 switch means for controlling the operation of said photoionizer and said electrospray
6 ionizer to control different modes of operation; and,
7 a detector that is coupled to said ionizing chamber.

1 22. (Original) The monitor of claim 21, wherein said electrospray ionizer includes a
2 vaporizer.

1 23. (Original) The monitor of claim 21, further comprising a chemical ionizer
2 coupled to said ionizing chamber and said switch means.

1 24. (Original) The monitor of claim 23, wherein said chemical ionizer includes a
2 vaporizer.

1 25. (Original) The monitor of claim 22, further comprising a vacuum interface
2 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
3 that is orthogonal to said electrospray ionizer vaporizer.

1 26. (Original) The monitor of claim 24, further comprising a vacuum interface
2 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
3 that is orthogonal relative to said electrospray ionizer vaporizer.

1 27. (Original) The monitor of claim 21, further comprising a processor that controls
2 said switch means.

3 28. (Original) The monitor of claim 21, wherein said switch means operates in a
4 mode where said electrospray ionizer and said photoionizer are sequentially activated.

1 29. (Original) The monitor of claim 21, said switch means operates in a mode where
2 said electrospray ionizer and said photoionizer are simultaneously activated.

1 30. (Original) The monitor of claim 28, wherein said switch means operates in a
2 mode wherein said electrospray ionizer and said photoionizer each generates a positive ion, then
3 each generates a negative ion.

1 31. (Original) The monitor of claim 28, wherein said switch means operates in a
2 mode wherein said electrospray ionizer and said photoionizer each generates pairs of positive
3 and negative ions sequentially in time.

1 32. (Original) The monitor of claim 21, wherein said switch means operates in a
2 mode where said photoionizer is on and said electrospray ionizer is switched between on and off
3 states.

1 33. (Original) The monitor of claim 21, wherein said switch means operates in a
2 mode wherein electrospray ionizer is on and said photoionizer is switched between on and off
3 states.

1 34. (Original) The monitor of claim 21, wherein said electrospray ionizer and said
2 photoionizer each have an electrode that is supplied a voltage from a same voltage source.

1 35. (Original) The monitor of claim 30, further comprising a chemical ionizer that is
2 coupled to said switch means to generate a positive ion sequentially with said electrospray
3 ionizer and said photoionizer, and then generates a negative ion sequentially with said
4 electrospray ionizer and said photoionizer.

1 36. (Original) The monitor of claim 30, further comprising a chemical ionizer that is
2 coupled to said switch means to generate a positive and negative pair of ions sequentially with
3 said electrospray ionizer and said photoionizer.

1 37. (Original) The monitor of claim 21, further comprising a valve that controls a
2 flow of a sample through an inlet of said electrospray ionizer and an inlet of said photoionizer.

1 38. (Original) The monitor of claim 37, wherein said valve sequentially allows the
2 sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 39. (Original) The monitor of claim 37, wherein said valve simultaneously allows
2 the sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 40. (Original) The monitor of claim 37, wherein said valve creates different
2 flowrates through said electrospray ionizer inlet and said photoionizer inlet.

1 41. (Original) A method for detecting a plurality of trace molecules, comprising:
2 ionizing a trace molecule with a photoionizer at approximately atmospheric pressure;
3 ionizing a trace molecule with an electrospray ionizer at approximately atmospheric
4 pressure;
5 detecting the ionized trace molecules; and,
6 switching a mode of operation of the photoionizer and the electrospray ionizer.

1 42. (Original) The method of claim 41, further comprising vaporizing a sample that
2 contains the trace molecules.

1 43. (Original) The method of claim 41, further comprising ionizing a trace molecule
2 with a chemical ionizer at approximately atmospheric pressure.

1 44. (Original) The method of claim 41, wherein the mode includes activating the
2 electrospray ionizer and the photoionizer sequentially.

1 45. (Original) The method of claim 41, wherein the mode includes activating the
2 electrospray ionizer and the photoionizer simultaneously.

1 46. (Original) The method of claim 44, wherein the mode includes activating the
2 electrospray ionizer and the photoionizer so that each generates a positive ion, then each
3 generates a negative ion.

1 47. (Original) The method of claim 44, wherein the mode includes activating the
2 electrospray ionizer and the photoionizer so that each generates pairs of positive and negative
3 ions sequentially in time.

1 48. (Original) The method of claim 41, wherein the mode includes maintaining the
2 photoionizer on, while switching the electrospray ionizer between on and off states.

1 49. (Original) The method of claim 41, wherein the mode includes maintaining the
2 electrospray ionizer on, while switching the photoionizer between on and off states.

1 50. (Original) The method of claim 44, further comprising ionizing a trace molecule
2 with a chemical ionizer in a mode where the chemical ionizer generates a positive ion
3 sequentially with the electrospray ionizer and the photoionizer, and then generates a negative ion
4 sequentially with the electrospray ionizer and the photoionizer.

1 51. (Original) The method of claim 44, further comprising ionizing a trace molecule
2 with a chemical ionizer in a mode where the chemical ionizer generates a positive and negative
3 ion pair sequentially with the electrospray ionizer and photoionizer.

1 52. (Original) The method of claim 41, wherein a sample with the trace molecules
2 sequentially flows through an electrospray ionizer inlet and a photoionizer inlet.

1 53. (Original) The method of claim 41, wherein a sample with the trace molecules
2 simultaneously flows through an electrospray ionizer inlet and a photoionizer inlet.

1 54. (Original) The method of claim 41, wherein a sample with the trace molecules
2 flows through an electrospray ionizer inlet and a photoionizer inlet at different flow rates.

1 55. (Original) A monitor that can detect a trace molecule, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a vacuum interface that is coupled to said ionizing chamber through an entrance;
4 an electrospray ionizer that is coupled to said ionizing chamber and has a vaporizer that is
5 orthogonal to said vacuum interface entrance; and,

6 a detector that is coupled to said vacuum interface.

1 56. (Original) The monitor of claim 55, further comprising a photoionizer coupled to
2 said ionizing chamber.

1 57. (Original) The monitor of claim 55, further comprising a chemical ionizer that is
2 coupled to said ionizing chamber and has a vaporizer that is orthogonal to said vacuum interface
3 entrance.

1 58. (Original) The monitor of claim 55, further comprising a valve that controls a
2 flow of a sample through an inlet of said electrospray ionizer and an inlet of said photoionizer.

1 59. (Original) The monitor of claim 58, wherein said valve sequentially allows the
2 sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 60. (Original) The monitor of claim 58, wherein said valve simultaneously allows
2 the sample to flow through said electrospray ionizer inlet and said photoionizer inlet.

1 61. (Original) The monitor of claim 58, wherein said valve creates different flow
2 rates through said electrospray ionizer inlet and said photoionizer inlet.

1 62. (Original) A monitor that can detect a trace molecule, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a vacuum interface that is coupled to said ionizing chamber through an entrance;

4 a chemical ionizer that is coupled to said ionizing chamber and has a vaporizer that is
5 orthogonal to said vacuum interface entrance; and,
6 a detector that is coupled to said vacuum chamber.

1 63. (Original) The monitor of claim 62, further comprising a photoionizer coupled to
2 said ionizing chamber.

1 64. (Original) A monitor that can detect a plurality of trace molecules, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a photoionizer that is coupled to said ionizing chamber;
4 a chemical ionizer coupled to said ionizing chamber;
5 a switch that controls the operation of said photoionizer and said chemical ionizer to
6 control different modes of operation; and,
7 a detector that is coupled to said ionizing chamber.

1 65. (Original) The monitor of claim 64, wherein said chemical ionizer includes a
2 vaporizer.

3 66. (Original) The monitor of claim 65, further comprising a vacuum interface
4 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
5 that is orthogonal to said chemical ionizer vaporizer.

1 67. (Original) The monitor of claim 64, further comprising a processor that controls
2 said switch.

3 68. (Original) The monitor of claim 64, wherein said switch operates in a mode
4 where said chemical ionizer and said photoionizer are sequentially activated.

1 69. (Original) The monitor of claim 64, wherein said switch operates in a mode
2 where said chemical ionizer and said photoionizer are simultaneously activated.

1 70. (Original) The monitor of claim 68, wherein said switch operates in a mode
2 wherein said chemical ionizer and said photoionizer each generates a positive ion, then each
3 generates a negative ion.

1 71. (Original) The monitor of claim 68, wherein said switch operates in a mode
2 wherein said chemical ionizer and said photoionizer each generates pairs of positive and negative
3 ions sequentially in time.

1 72. (Original) The monitor of claim 64, wherein said switch operates in a mode
2 where said photoionizer is on and said chemical ionizer is switched between on and off states.

1 73. (Original) The monitor of claim 64, wherein said switch operates in a mode
2 wherein said chemical ionizer is on and said photoionizer is switched between on and off states.

1 74. (Original) A monitor that can detect a plurality of trace molecules, comprising:
2 a housing with an ionizing chamber that is approximately at one atmosphere;
3 a photoionizer that is coupled to said ionizing chamber;
4 a chemical ionizer coupled to said ionizing chamber;

5 switch means for controlling the operation of said photoionizer and said chemical ionizer
6 to control different modes of operation; and,
7 a detector that is coupled to said ionizing chamber.

1 75. (Original) The monitor of claim 74, wherein said chemical ionizer includes a
2 vaporizer.

1 76. (Original) The monitor of claim 74, further comprising a vacuum interface
2 coupled to said ionizing chamber and said detector, said vacuum interface having an entrance
3 that is orthogonal to said chemical ionizer vaporizer.

1 77. (Original) The monitor of claim 74, further comprising a processor that controls
2 said switch means.

3 78. (Original) The monitor of claim 74, wherein said switch means operates in a
4 mode where said chemical ionizer and said photoionizer are sequentially activated.

1 79. (Original) The monitor of claim 74, said switch means operates in a mode where
2 said chemical ionizer and said photoionizer are simultaneously activated.

1 80. (Original) The monitor of claim 78, wherein said switch means operates in a
2 mode wherein said chemical ionizer and said photoionizer each generates a positive ion, then
3 each generates a negative ion.

1 81. (Original) The monitor of claim 78, wherein said switch means operates in a
2 mode wherein said chemical ionizer and said photoionizer each generates pairs of positive and
3 negative ions sequentially in time.

1 82. (Original) The monitor of claim 74, wherein said switch means operates in a
2 mode where said photoionizer is on and said chemical ionizer is switched between on and off
3 states.

1 83. (Original) The monitor of claim 74, wherein said switch means operates in a
2 mode wherein chemical ionizer is on and said photoionizer is switched between on and off states.

1 84. (Original) A method for detecting a plurality of trace molecules, comprising:
2 ionizing a trace molecule with a photoionizer at approximately atmospheric pressure;
3 ionizing a trace molecule with an chemical ionizer at approximately atmospheric
4 pressure;
5 detecting the ionized trace molecules; and,
6 switching a mode of operation of the photoionizer and the chemical ionizer.

1 85. (Original) The method of claim 84, further comprising vaporizing a sample that
2 contains the trace molecules.

1 86. (Original) The method of claim 84, wherein the mode includes activating the
2 chemical ionizer and the photoionizer sequentially.

1 87. (Original) The method of claim 84, wherein the mode includes activating the
2 chemical ionizer and the photoionizer simultaneously.

1 88. (Original) The method of claim 86, wherein the mode includes activating the
2 chemical ionizer and the photoionizer so that each generate a positive ion, then each generate a
3 negative ion.

1 89. (Original) The method of claim 86, wherein the mode includes activating the
2 chemical ionizer and the photoionizer so that each generate pairs of positive and negative ions
3 sequentially in time.

1 90. (Original) The method of claim 84, wherein the mode includes maintaining the
2 photoionizer on, while switching the chemical ionizer between on and off states.

1 91. (Original) The method of claim 84, wherein the mode includes maintaining the
2 chemical ionizer on, while switching the photoionizer between on and off states.